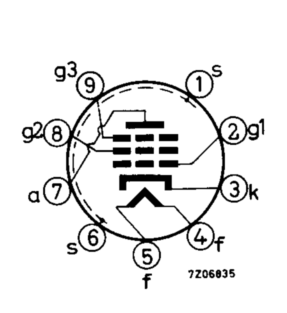
S.Q. TUBE

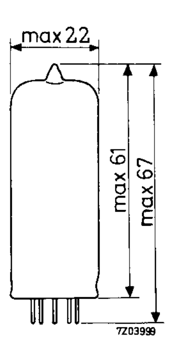
Special quality output pentode designed for use in telephone equipment.

QUICK REFERENCE DATA			
Life test	10 000 hours		
Base	Noval. Gold plated pins		
Heating	Indirect a.c. or d.c. Series or parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	375	mA
Anode current	I_a	20	mA
Output power	W_o	1	W

DIMENSIONS AND CONNECTIONS Dimensions in mm

Base: Noval





CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	375	355- 395		mA
Anode voltage	V_a	210			V
Grid No.3 voltage	V_{g_3}	0			V
Grid No.2 voltage	V_{g_2}	210			V
Cathode resistor	R_k	120			Ω
Anode current	I_a	20	17- 23	min.13.5	mA
Grid No.2 current	I_{g_2}	5.3	4.1- 6.5	min. 3.1	mA
Mutual conductance	S	11	9.5-12.5	min. 7.8	mA/V
Internal resistance	R_i	0.3	min. 0.2		MΩ
Amplification factor grid No.2 to grid No.1	$\mu_{g_2g_1}$	36			
Equivalent noise resistance	R_{eq}	1.2			kΩ
Negative grid current	$-I_{g_1}$		max. 0.5	max. 1.0	μA
Hum voltage Grid resistor R_{g_1} = 0.5 MΩ Heater centre earthed Cathode resistor bypassed	V_{g_1}		max. 0.2		mV_{RMS}
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 120 V	I_{kf}		max. 24		μA

CAPACITANCES

		I	II	
Anode to grid No.3, grid No.2 cathode heater and screen	C_{a/g_3g_2kfs}	6.5	5.9 - 7.1	pF
Grid No.1 to grid No.3, grid No.2 cathode heater and screen	C_{g_1/g_3g_2kfs}	11.2	10.4 - 12	pF
Grid No.1 to grid No.3, grid No.2 cathode heater and screen Measured with cathode current I_k = 25 mA	C_{g_1/g_3g_2kfs}	14.3		pF
Anode to grid No.1	C_{ag_1}		max. 0.02	pF
Grid No.1 to heater	C_{g_1f}		max. 0.2	pF
Cathode to heater	C_{kf}	4.2		pF



SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) under the following conditions during 10.000 hours.

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	120	Ω

LIMITING VALUES (Design centre rating system)

Anode voltage	V_{a_o}	max.	550	V
	V_a	max.	210	V
Anode dissipation	W_a	max.	4.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	550	V
	V_{g_2}	max.	210	V
Grid No.2 dissipation	W_{g_2}	max.	1.2	W
Cathode current	I_k	max.	30	mA
Grid No.1 resistor:				
automatic bias	R_{g_1}	max.	0.5	MΩ
fixed bias	R_{g_1}	max.	0.25	MΩ
Voltage between cathode and heater	V_{kf}	max.	120	V
Bulb temperature	t_{bulb}	max.	170	^{o}C

Heater voltage: The average heater voltage should be 6.3 V. Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life. The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

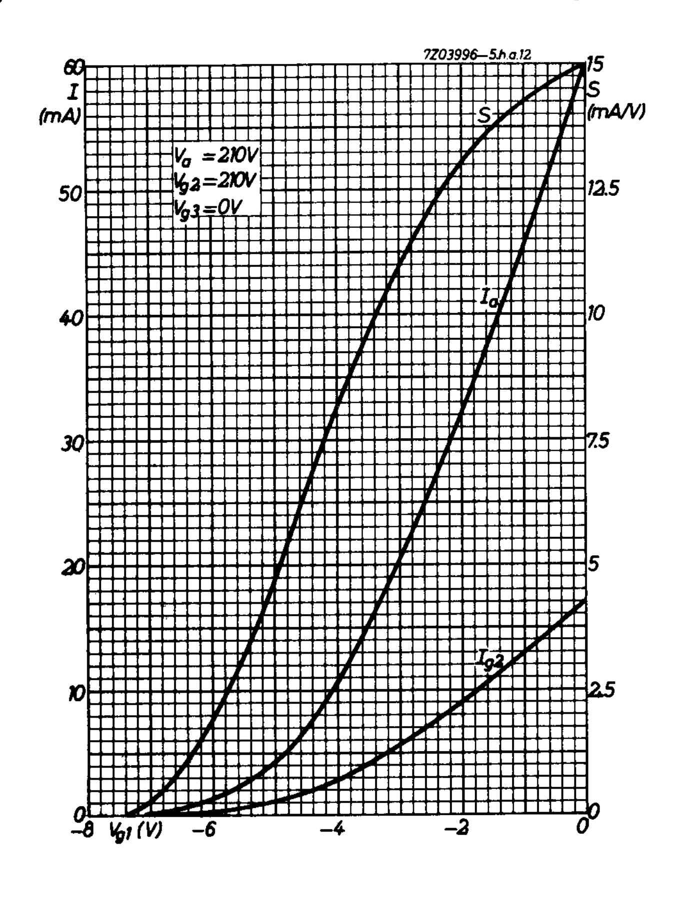
Output tube. Class A

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	120	Ω
Load resistance	$R_{a\sim}$	15	kΩ
Anode current	I_a	20	mA
Grid No.2 current	I_{g_2}	5.3	mA
Output power	W_o	1	W
Total distortion	d_{tot}	5	%

OPERATING CHARACTERISTICS (continued)

Amplifier

Anode voltage	V_a	210	V
Grid No.3 voltage	V_{g_3}	0	V
Grid No.2 voltage	V_{g_2}	210	V
Cathode resistor	R_k	180	Ω
Load resistance	$R_{a\sim}$	20	kΩ
Anode current	I_a	15	mA
Grid No.2 current	I_{g_2}	4	mA
Voltage gain	V_o/V_i	5.15	N



7Z03993–5.h.a.12

I_a (mA)

50
40
30
20
10
0

V_{g1}=0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−3V
−3.5V
−4V
−4.5V
−5V
−5.5V
−6V

W_a = 4.5W

V_{g2}=210V
V_{g3}=0V

0 50 100 150 200 250 300 V_a (V) 350

7Z03995–5.h.a.12

V_i (V_{rms})

3
2
1
0

I (mA)
d(%)

30
20
10
0

V_a = 210V
V_{g2} = 210V
R_a = 15kΩ
R_k = 120Ω
V_{g3} = 0V

V_i
d_{tot}
I_a
I_{g2}

0 0.5 1 1.5 2 W_o (W) 2.5



7Z03994–5.h.a.12

W_o (W)

V_a = 210V
V_{g2} = 210V
R_k = 120Ω
V_{g3} = 0V

I_{g1} = +0.3μA
d = 10%
d = 5%
d = 2.5%
d = 1%

R_a (kΩ)

7Z03997–5.h.a.12

ΔC_{g1} (pF)

V_a = 210V
V_{g2} = 210V
V_{g3} = 0V
R_k = 0Ω

I_k (mA)



7Z03992—5.h.a.12

$V_{g1} = 0\,V$ $-1\,V$ $-2\,V$ $-3\,V$ $-4\,V$ $-5\,V$ $-6\,V$

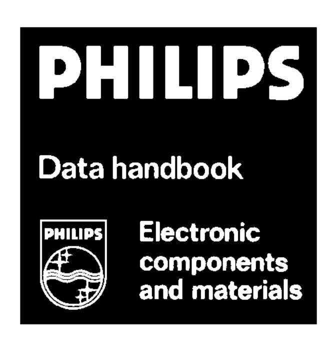
$W_a = 5.6\,W$

I_a (mA)

I_a V_a V_{g1}

0 10 20 30 40

0 50 100 150 200 250 300 V_a (V)



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page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
7	7	1968.12
8	8	1968.12
9	FP	2000.11.17